

Distribution extension in Colombia and new records for Brazil of *Micrurus isozonus* (Cope, 1860) (Squamata, Serpentes, Elapidae)

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ABSTRACT: *Micrurus isozonus* is a triadal coralsnake occurring in northern Venezuela, eastern Colombia, southern Guyana, and in the extreme northern Brazil. In this paper we firstly publish vouchers to Brazil, and report additional records from three localities in the mountainous region of Taião and Apiaú, state of Roraima. We also extend its known range to the Trans-Andean region in the Atlantic coast of northern South America, municipality of Cartagena at the Caribbean coast of Colombia. Additionally, we present meristic and morphometric data, including the species syntypes.

Elaps isozonus was described by Cope (1860) based on three specimens from an unknown location in South America. Later, Boulenger (1920) described *Elaps omissus* based on a female from Venezuela. Schmidt (1936) placed *E. isozonus* in the genus *Micrurus* and considered *E. omissus* as a junior synonym of *M. isozonus*. Roze (1955) restricted the type locality of *M. isozonus* to Caracas in Venezuela (Figure 1) and, posteriorly, Roze (1996), reported the morphological variation of the species on the basis of 65 specimens. This species can be diagnosed by the combination of the following characters: white snout with irregularly black marked scales followed by a black interorbital band and a red parietal band; first triad complete with white and black rings of about the same length, red rings with black tipped scales; 199–217 ventral in males and 215–225 in females; 26–33 subcaudals in males and 25–29 in females. 10–13 complete body triads in males and 10–14 in females; tail with a complete triad or 1½ on both sexes (Roze, 1996).

According to Campbell and Lamar (2004) *M. isozonus* is common in the semiarid regions with seasonal droughts of Colombia from east of the Andes (dry forested areas of Apure-Villavicencio region) throughout the Llanos Orientales (savannas) and similar formations of northern and central Venezuela, including the moist forest enclaves of Cordillera de la Costa and surrounding xeric scrublands and the similarly covered Margarita island. This species inhabit tropical deciduous forest, tropical thorn woodland, savanna and gallery forest. Records include pastures and other open or semiopen secondary growth, forests along the Andean foothills in Meta, Colombia, and in the lower montane wet forest in Northern of Venezuela (Campbell and Lamar, 2004). Further, Campbell and Lamar (2004) argue that the Venezuelan occurrence of *M. isozonus* distributes mainly north of the Orinoco river, being absent in the western mountainous region and humid environments southern and eastern Venezuela, despite

adequate environment in the Gran Sabana region (Venezuela and adjacent Brazil), but they did not mentioned the source of this information. Roze (1996) had already reported *M. isozonus* from the region of Rio Cotinga, state of Roraima, northern Brazil, what was also mentioned by Campbell and Lamar (2004), but he never mentioned any museum voucher. Kok *et al.* (2003) recorded *M. isozonus* from Dadanawa Ranch, South Rupununi Savannas of Guyana, but no descriptions were presented on the variation of that sample (Figure 1).

We examined here 53 specimens of *M. isozonus* listed in Appendix 1 and housed at the following herpetological collections: **Brazil:** Museu Paraense Emílio Goeldi (MPEG) Belém; Museu de Zoologia – Universidade de São Paulo (MZUSP) São Paulo; **Colombia:** Instituto de Ciencia Naturales (ICN) Bogotá; **England:** The Natural History Museum (BMNH) London; **France:** Muséum National d'Histoire Naturelle (MNHN) Paris; **Germany:** Senckenberg Museum Frankfurt (SMF) Frankfurt; Zoologische Museum Berlin (ZMB) Berlin; Zoologische Museum Hamburg (ZMH) Hamburg; Zoologische Staatssammlung München (ZSM) München; **United States of America:** Academy of Natural Sciences of Philadelphia (ANSP) Philadelphia; American Museum of the Natural History (AMNH) New York; Carnegie Museum of Natural History (CM) Pittsburg; Field Museum of Natural History (FMNH) Chicago; Natural History Museum University of Kansas (KU) Kansas; Museum of Comparative Zoology University of Harvard (MCZ) Boston; Museum of Zoology University of Michigan (UMMZ) Michigan; United State National Museum (USNM) Washington DC. The description of the external morphology (color pattern and scale terminology) followed Silva Jr. and Sites (1999). We report four additional specimens of *M. isozonus* from the Brazilian state of Roraima and a specimen from the region of Cartagena, department of Bolívar, Colombia, being the first record of this species for the Trans-Andean region. In the present paper, we also included the specimens described

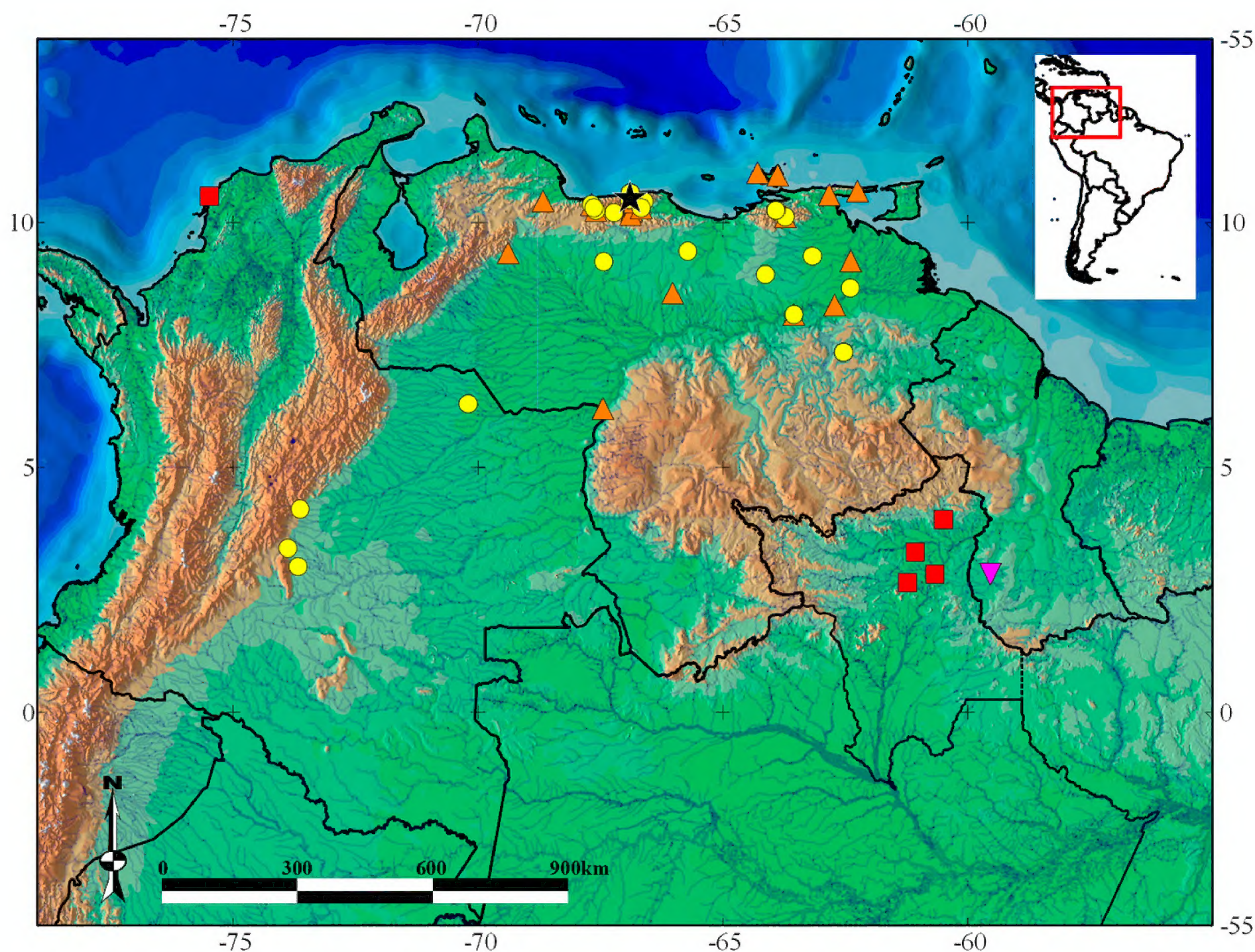


FIGURE 1. Records of *Micrurus isozonus*. Legend: Star: type-locality, in Venezuela; Red square: new records (the westernmost record in Colombia, and the Brazilian records with southeast distribution); Yellow circle: comparative material; Orange triangle: literature records in Venezuela, obtained from Roze (1955; 1966); Purple inverted triangle: additional literature record in Guyana, from Kok *et al.* (2003).

by Roze (1996) for Brazil (AMNH 36064; AMNH 36066), and the syntypes of *M. isozonus* (ANSP 6804, ANSP 6805) as well as its synonym (BMNH 1946.1.27.15), holotype of *Elaps omissus*.

Micrurus isozonus was recorded for Brazil by Roze (1996) based on two specimens from the region of Contão, Igarapé do Limão, at the confluence of the rivers Cotinga and Surumu, currently within the limits of the Raposa Serra do Sol indigenous land (3°56'10.08" N, 60°29'39.02" W) (AMNH 36064 and AMNH 36066; Figure 2). This locality (Igarapé do Limão) mentioned by Roze (1996) and later by Kok *et al.* (2003) and Campbell and Lamar (2004) is about 100 km south of the indicated by these authors in their distributional maps (Figure 1). We present here four additional Brazilian specimens, from the following localities in Roraima state: MPEG 489, from the region of Colônia Coronel Mota (Taiano Village), mountainous region of Taião, municipality of Alto Alegre (3°16'11.01" N, 61°4'20.78" W); MZUSP 9181 and MZUSP 10702, from Apiaú, municipality of Boa Vista (2°48'40.78" N, 60°42'30.49" W); and MZUSP 9180, from Fazenda Monte Cristo, municipality of Boa Vista (2°52'00.47" N, 60°44'00.04" W) (Figure 2). Savannas, at altitudes not exceeding 170 m, cover these Brazilian localities.

The Table 1 shows the variation in the number of ventral (VE) and subcaudal (SC) scales; number of triads in body (TriB) and tail (TriT); snout-vent length (SVL); tail length (TL) and head length (HL) of the all examined specimens from Brazil, as well as comparisons with syntypes of *M.*

isozonus and the holotype (*Elaps omissus*). In general, the cephalic coloration of the specimens are very similar, with rostral, 1st, 2nd, and 3rd supralabials, nasals, internasals, and prefrontals white, with irregular black spots or with black borders of scales; followed by a black transversal band at the level of the eyes (median region of the frontal, most of the supraoculars, posterior border of preoculars, anterior borders of postoculars, posterior ½ of 3rd and 4th supralabials); the red parietal band is anterior to the first triad which may begin at the posterior tip of the parietals of after two or three dorsal scales. Ventrally, the irregular black markings may be restricted to the mentonian region or include the anterior genials and first pair of infralabials; posterior genials, 1st and 2nd preventrals completely red, the 1st triad of body begins in the third preventral. The rest of the top and sides of the head are red, with black forward extensions of the anterior black ring of the first triad over a ⅓ of both parietals (Figure 2; Figure 3).

The new record for Colombia is from the region of Cartagena, department of Bolivar in the Caribbean coast of the country (10°32'21.81" N, 75°29'8.15" W; MNHN 0.3927). According to Olson *et al.* (2001), Cartagena is covered by xeric scrubland landscapes, reinforcing the affinity of *M. isozonus* with open stands of vegetational formations. This specimen is an adult male, SVL: 640 mm; TL: 54.5 mm; HL: 17.55 mm; 208 ventral scales; 27 subcaudal scales. The specimen has 13 body triads and one complete tail triad with the black rings narrower (2 dorsal scales) than the white rings (4–5 dorsal scales; Figure 3).

TABLE 1. Meristic and morphometric (mm) data from the Brazilian records of *Micrurus isozonus*, including the additional samples, the syntypes (*), and the holotype of *Elaps omissus* (**). See the text for abbreviations.

MUSEUM VOUCHERS	SEX	VE	SC	TriB	TriT	SVL	TL	HL
ANSP 6804 *	♂	213	29	11	1	481	41.07	15.48
ANSP 6805 *	♀	217	26	11	1	640	48.55	20.74
BMNH 1946.1.27.15 **	♂	209	28	12	-	480	27.12	12.17
AMNH 36066	♀	219	29	11	1⅓	805	62.98	24.61
AMNH 36064	♀	214	32	11	1⅓	-	31.57	11.58
MPEG 489	♀	213	28	11	1⅓	590	51.00	19.00
MZUSP 10702	♀	220	28	12	1	553	57.00	14.39
MZUSP 9180	♂	208	34	12	1⅓	198	19.98	10.4
MZUSP 9181	♀	221	35	11	1⅓	216	19.00	9.00



FIGURE 2. Dorsal view of the specimens of *Micrurus isozonus* examined: AMNH 36064 (A), AMNH 36066 (B), MZUSP 9181 (C), MPEG 489 (D), MZUSP 9180 (E), and MZUSP 10702 (F) (Photos: D. T. Feitosa; M. G. Pires).

The variation of the number of ventrals, subcaudals, and body and tail triads are within the intervals found in the literature (Roze, 1955, 1966; Roze 1996; Kok *et al.*, 2003; Campbell and Lamar 2004); the specimen MPEG 489 has a fusion of the 8th and 9th body triads. The fusion of body triads in *Micrurus* is a common anomaly present in several groups of species (Savage and Slowinski 1992; Feitosa *et al.* 2007). The red and white rings are black tipped in all specimens.

Summarizing, the new records presented extend the known range of *Micrurus isozonus* to the Trans-Andean region of the Atlantic coast of Colombia, and add

distributional information in a very poorly-known region, in the state of Roraima, northern Brazil. The Colombian record extends the known range of *M. isozonus* about 400 km west from the closest known record, in Venezuela. We confirm the species occurrence in Brazil offering vouchers and precise coordinates, and the three additional localities in Brazil slightly expand southward (about 100 km) the known distribution in the country. Overall, our records are located out of the Orinoco river basin, different than most of previous records. This paper help to elucidate the real distribution of *M. isozonus*, which should be the framework to propose priority areas to conserve this species.

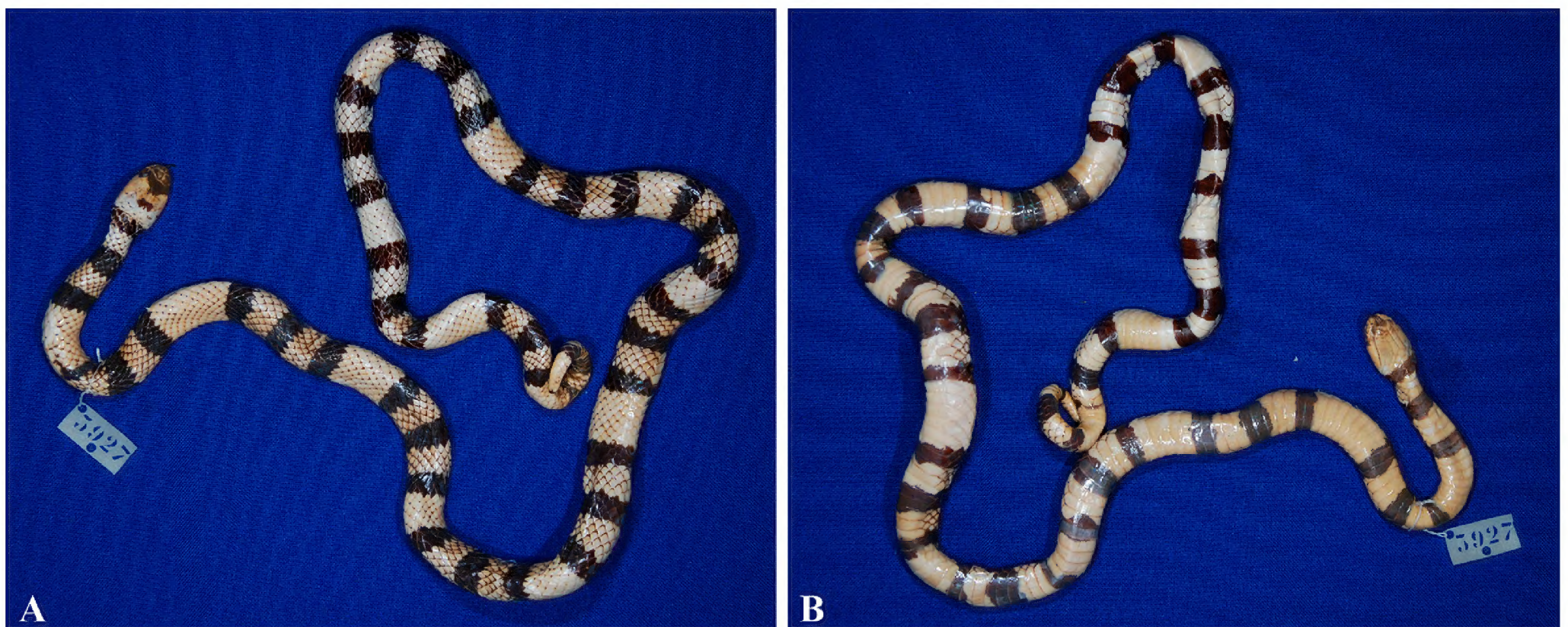


FIGURE 3. Dorsal (A) and ventral (B) views of the body of *Micrurus isozonus* (MNHN 0.3927) from Cartagena, department of Bolívar, Colombia (SVL: 640 mm; TL: 54.5 mm) (Photos: D.T. Feitosa).

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APPENDIX. Analyzed material.

TYPE SERIES: **South America:** ANSP 6804, ANSP 6805; **Venezuela:** BMNH 1946.1.27.15

NEW RECORDS: **Brasil: Roraima:** Alto Alegre: Vila do Taiano, Serra do Taião MPEG 489; Apiaú MZUSP 10702; Boa Vista MZUSP 9181; Uiramutã, Limão, Rio Cotinga (Indigenous land Raposa Serra do Sol) AMNH 36064, AMNH 36066. **Colombia: Bolívar:** Cartagena MNHN 0.3927.

ADDITIONAL MATERIAL: **Colombia: Arauca:** Cravo Norte ICN 2136; Meta: Piñalito ICN 1878; San Juan de Arama FMNH 83045; Villavicencio ICN 7040. **Venezuela: Anzoátegui:** San Tome USNM 146380; **Aragua:** El Limón MZUSP 7829; Maracay ZSM 95/1947; Guamitas UMMZ 124218; Rancho Grande AMNH 110156, AMNH 137300; Ciudad Bolívar SMF 20750; **Bolívar:** El Manteco AMNH 111088, AMNH 114796, AMNH 111086, AMNH 111087, AMNH 114795, AMNH 114807, AMNH 114808; **Distrito Federal:** Caracas SMF 20751, ZMB 7072a, ZSM 103/1947, ZSM 1798-2006, ZMB 2732, ZMB 7072b, ZSM 165/1930/1(a), ZSM 165/1930/2(b), ZSM 96/1947, MZUSP 8634, AMNH 92993; Caracas: El Valle AMNH 59390, AMNH 59391; **Guárico:** Angostura ZMB 2734; San

Juan de los Morros KU 182730; **Miranda:** Quebrada de Cloris CMNH 69361; Santa Lucia CMNH S7458; **Monagas:** Maturín FMNH 214902; San Antonio de Maturín MCZ 9978; Sotillo, near Uracoa CMNH 17386; **Sucre:** Cumanacoa CMNH S7961; San Rafael CMNH S7846; Vargas: La Guaira ZMH 354, ZMB 2713, ZMB 2730, ZMB 2731.

LITERATURE RECORDS: **Roze (1955): Venezuela: Apure:** Apure-Orinoco River MHNLS (MHNLS 1375); **Aragua:** Rancho Grande FA (FAUCV); **Distrito Federal:** Caracas: MBUCV; Near Caracas: MCN (3 specimens), PT (PTUCV) (3 specimens); Cerro Ávila MHNLS; Los Venados MHNLS. Miranda: Doz Camiños MHNLS; Turgua MHNLS (MHNLS 1368). Nueva Esparta: San Francisco de Macanao, Isla Margarita MHNLS (MHNLS 4364); Cuerva del Piache, Isla Margarita MHNLS (MHNLS 4373). **Roze (1966): Venezuela: Aragua:** Maracay MBUCV; **Bolívar:** Puerto Ordaz MBUCV; **Guárico:** Espino MBUCV; **Miranda:** Charavalle MBUCV; Los Chorros MCN 124; Cúa MBUCV; **Nueva Esparta:** La Soledad, Isla Margarita MBUVC; **Portuguesa:** La Aparición MHNLS 15156; **Sucre:** El Patao, near Puerto de Hierro MBUCV; Yaracuy: Valles de Yaracuy. **Kok *et al.* (2003): Guyana: Region 9:** Dadanawa Ranch IRSNB 16573, IRSNB 16575.